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10/777,062	02/13/2004	Ming-Der Lin	MR3003-77	5636

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EXAMINER

RICHARDS, N DREW

ART UNIT PAPER NUMBER

2815

DATE MAILED: 09/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/777,062	<b>Applicant(s)</b> LIN ET AL.	
	<b>Examiner</b> N. Drew Richards	<b>Art Unit</b> 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 20 June 2005.  
 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-41 is/are pending in the application.  
     4a) Of the above claim(s) 1-25, 32 and 41 is/are withdrawn from consideration.  
 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
 6) ☒ Claim(s) 26-31 and 33-40 is/are rejected.  
 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☒ The drawing(s) filed on 13 February 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☒ All    b) ☐ Some \*    c) ☐ None of:  
         1. ☒ Certified copies of the priority documents have been received.  
         2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
         3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                                    | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election of Species III in the reply filed on 6/20/05 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Applicant has indicated that claims 26-31 read on the elected species. Upon further review, the examiner finds that claims 26-31 and 33-40 read on the elected species. Thus, claims 26-31 and 33-40 are considered herein.

### ***Drawings***

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the transparent contact layer, ohm contact layer, light-reflective layer, and the combination thereof must be shown in the figures of the elected species or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet,

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and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

3. Claims 26-31 and 33-40 are objected to because of the following informalities: claim 26 line 9 should recite "the top surface"; claim 26 line 11 should recite "the top surface"; claim 26 line 14 should recite "a part of." Appropriate correction is required.

4. Applicant is advised that should claim 28 be found allowable, claim 36 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 26-31 and 33-40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 26 line 12 recites at least one extended trench provided at the first electrode in proper place. Claiming an element "in proper place" is indefinite as it does not clearly define where the element is formed. There is no language in the claims, or explicit definition in the specification, to indicate to one of ordinary skill in the art what is a proper place or not. Thus, one cannot reasonably ascertain the meets and bounds of the claims and the claim is indefinite. The dependent claims do not remedy the issue and are thus also indefinite.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 26, 27, 34, 35, 37 and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Kotaki et al. (U.S. Patent No. 5,281,830).

Kotaki et al. disclose a light-emitting device with an enlarged active light-emitting region in figure 1, for example, the main structure thereof comprising:

- a LED substrate 1;
- an epitaxial layer, including a first material layer 3/4 and a second material layer 5, wherein the first material layer is formed on the top surface of the LED substrate and the second material layer is then formed on the top surface of the first material layer, a light-emitting region naturally included between the first material layer and the second material layer;
- a second electrode 7, securely provided on one part of the top surface of the second material layer;
- a first electrode 8, securely provided on the other part of the top surface of the second material layer;
- at least one extended trench 15 provided at the first electrode in proper place, each extended trench passing through the second material layer and a part of the first material layer, at least one extended electrode electrically connected to the first electrode being provided inside the extended trench (trench 15 is labeled in figures 2-7; the portion of electrode 8 formed inside the trench in layers 3/4/5 is considered the "extended electrode"); and
- at least one isolation trench 9, provided between the first electrode 8 and the second electrode 7 and allowed for passing through the second material layer and a part of the first material layer.

With regard to claim 27, the first electrode and the second electrode are located in approximately horizontal levels.

With regard to claim 34, an isolation layer (air in the gap) is further provided inside the isolation trench.

With regard to claim 35, as seen in the intermediate step of figure 7, the first electrode and second electrode are allowed for covering an overall top surface of the second material layer and are made from an electro-conductive and light-reflective material, respectively. The first and second electrodes are made from aluminum, which is both electro-conductive and light-reflective.

With regard to claim 37, the LED substrate is sapphire.

With regard to claim 38, the epitaxial layer is made from a material presented as a mode selected from the group of a ternary mode, quaternary mode, and the combination thereof.

### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 28 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kotaki et al. as applied to claims 26, 27, 34, 35, 37 and 38 above.

Kotaki does not explicitly disclose the further limitation of providing a transparent contact layer, ohm contact layer, light-reflective layer and the combination thereof between the first material layer and the first electrode. Nonetheless, the addition of any one of these layers is considered obvious to one of ordinary skill in the art. At the time of the invention it would have been obvious to one of ordinary skill in the art to include an ohm contact layer to reduce the contact resistance to the first material layer and to improve current spreading to the first material layer, or to form a light-reflective layer to improve the efficiency of the device by allowing for a greater amount of the light produced to be emitted from the bottom of the device by reflecting the light emitted towards the top so that it then emits from the bottom.

11. Claims 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kotaki et al. as applied to claims 26, 27, 34, 35, 37 and 38 above, and further in view of Uemura (US 2003/0222270 A1).

Kotaki teach forming a light-emitting device having a pn junction and bump connections (with face down) formed for both electrodes on the upper layer (column 2 lines 25-30, for example). One of ordinary skill in the art would recognize from this description that the LED of Kotaki may be flip-chip bonded. However, Kotaki fails to explicitly teach any details of the bonding of their chip. In fact, Kotaki fails to explicitly teach any method of bonding, packaging, or assembling their device.

Uemura teach a pn junction LED that is flip-chip bonded to a package in a manner well known in the art. Uemura teach in figure 6, for example, a substrate 61

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provided with a first electro-conductive layer 63 and a second electro-conductive layer 64 on the top surface thereof, wherein the first electro-conductive layer 63 is electrically connected to a first electrode 16 on an LED chip by a first electro-conductive bump 20, and the second electro-conductive layer 64 is electrically connected to a second electrode 17 on an LED chip by a second electro-conductive bump 21. It would have been obvious to one of ordinary skill in the art to bond the LED of Kotaki using the flip chip method of Uemura in order to use a common, well understood bonding method to allow the LED to be connected to other circuitry and other devices. One of ordinary skill in the art would recognize that it is well known to use ceramics, AlN, SiC, Al<sub>2</sub>O<sub>3</sub>, epoxy, urea resin, plastic, diamond, BeO, BN, circuit board, printed circuit board, PC board, metal-containing compound, and the combination thereof for the support of Uemura as these are well known supports that LED chips are commonly bonded to. The LED device of Uemura and Kotaki is a flip chip light-emitting diode.

12. Claims 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kotaki et al. as applied to claims 26, 27, 34, 35, 37 and 38 above, and further in view of Wu et al. (U.S. Patent No. 6,445,007 B1).

With regard to claim 33, Kotaki fails to explicitly teach the extended trench being a shape of a point, bar, ring, circle, rectangle, straight line, half-ring, and the combination thereof.

With regard to claim 39, Kotaki fails to explicitly teach the extended trench being provided around the periphery of the second material. Kotaki does teach the extended

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trench being allowed for passing through a part of the first material layer and the extended electrode being provided inside the extended trench.

With regard to claim 40, Kotaki fails to teach the extended electrode being a perimeter electrode.

Wu et al. teach LED's in figure 8 for example. Wu et al. teach arranging the n-contact (first electrode) as a perimeter electrode that is shaped as a ring, having straight line portions as well as partial circular portions and being provided around the periphery of the second material.

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ the perimeter electrode of Wu et al. in the device of Kotaki et al. The motivation for doing so is to improve current spreading and efficient usage of the light-emitting area (Wu et al. column 5 lines 7-15). In using the shape of the n-contact of Wu in the trench electrode structure of Kotaki, it is obvious that the extended trench in which the n-contact portion of the electrode is formed would be formed in the periphery arrangement of Wu. This is obviously done to allow the electrode 8 to contact the first material layer 3/4 of Kotaki in the ring-shaped manner taught by Wu.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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